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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/534,368	OGURA ET AL.	
	Examiner	Art Unit	
	Robert T. Crow	1634	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *01 July 2008*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1,4,5,8,10-13 and 17-25* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1, 4-5, 8, 10-13, and 17-25* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *7/1/08*.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application

6) ☐ Other: _____.

FINAL ACTION

Status of the Claims

1. This action is in response to papers filed 1 July 2008 in which the specification and claims 1, 5, 8, and 10 were amended, no claims were canceled, and new claims 22-25 were added. All of the amendments have been thoroughly reviewed and entered.

The previous rejections under 35 U.S.C. 112, first paragraph, are withdrawn in view of the amendments.

The previous rejections under 35 U.S.C. 112, second paragraph, are withdrawn in view of the amendments.

The previous rejections under 35 U.S.C. 103(a) not reiterated below are withdrawn in view of the amendments. Applicant's arguments have been thoroughly reviewed and are addressed following the rejections necessitated by the amendments.

Claims 1, 4-5, 8, 10-13, and 17-25 are under prosecution.

Specification

2. The amendment filed 1 July 2008 is objected to under 35 U.S.C. 132(a) because it introduces new matter into the disclosure. 35 U.S.C. 132(a) states that no amendment shall introduce new matter into the disclosure of the invention. The added material which is not supported by the original disclosure is as follows: Applicant has amended the paragraph at page 34, lines 9-25 to include "(means for applying a negative voltage)." While the phrase appears to be an attempt at further describing top gate driver 11, the limitation "means for applying a negative voltage" is significantly

broader in scope because the phrase encompasses structures other the top gate driver. Because the scope of the phrase “means for applying a negative voltage” is broader that the recitation of a top gate driver, the phrase constitutes new matter.

3. Applicant is required to cancel the new matter in the reply to this Office Action.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

6. Claims 1, 5, and 20-22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hollis et al (U.S. Patent No. 5,846,708, issued 8 December 1998) in view of Yasuda et al (U.S. Patent No. 6,093,370, issued 25 July 2000) in view of Yagi (U.S. Patent Application Publication No. US 2002/0081716 A1, published 27 June 2002) and, as applied to claim 20, as evidenced by Manley (U.S. Patent No. 5,855,745, issued 5 January 1999) and, as applied to claim 21, as evidenced by Morris (U.S. Patent No. 5,859,581, issued 12 January 1999).

Regarding claim 1, Hollis et al teach an optical DNA sensor. In a single exemplary embodiment, Hollis et al teach a device comprising a solid imaging device, in the form of an underlying CCD array having an array test sites formed thereon (Figure 15 and column 3, lines 50-55). Each test site of the array has DNA probes fixed (i.e., attached) thereon (column 4, lines 25-65). The probes at each test site are different (column 3, lines 1-8); thus, the sensor comprises a plurality of types of DNA probes each including a different nucleotide sequence. The CCD array comprises a plurality (i.e., at least 2, Figure 15) of photoelectric elements arranged on a substrate (Figure 15).

It is noted that a reference may be relied upon for all that it would have reasonably suggested to one having ordinary skill the art, including nonpreferred embodiments. *Merck & Co. v. Biocraft Laboratories,* 874 F.2d 804, 10 USPQ2d 1843 (Fed. Cir.), cert. denied, 493 U.S. 975 (1989). See also *Upsher-Smith Labs. v. Pamlab, LLC*, 412 F.3d 1319, 1323, 75 USPQ2d 1213, 1215 (Fed. Cir. 2005)(reference disclosing optional inclusion of a particular component teaches compositions that both

do and do not contain that component); Celeritas Technologies Ltd. v. Rockwell International Corp., 150 F.3d 1354, 1361, 47 USPQ2d 1516, 1522-23 (Fed. Cir. 1998) (The court held that the prior art anticipated the claims even though it taught away from the claimed invention. "The fact that a modem with a single carrier data signal is shown to be less than optimal does not vitiate the fact that it is disclosed."). Thus, the teaching of Hollis et al that the material to which the DNA probes are fixed **may** be light-transmissive (column 9, lines 15-32) encompasses the alternate embodiment wherein the material is **not** light-transmissive; i.e., absorbs exciting light. See MPEP § 2123 [R-5].

While Hollis et al teach the photosensor array comprises gate electrodes 220 provided in the solid state imaging device and other layers (Figure 15), Hollis et al do not explicitly teach a conductive layer.

However, Yasuda et al teach an array of electrodes 226 having polynucleotides immobilized thereon and further comprising a conductive coating in the form of electrically conductive film 131 placed on top of electrodes 226, which are embedded in the solid state device (Figure 11 and column 11, lines 40-65). Yasuda et al also teach the conductive film has the added advantage of allowing the inducing of polynucleotides in solution (i.e., target polynucleotides) to the substrate of the device (column 12, lines 45-60), which accelerates the rate of hybridization by bringing the targets to the substrate more quickly.

It is noted that the courts have held that "while features of an apparatus may be recited either structurally or functionally, claims directed to an apparatus must be

distinguished from the prior art in terms of structure rather than function." *In re Schreiber*, 128 F.3d 1473, 1477-78, 44 USPQ2d 1429, 1431-32 (Fed. Cir. 1997). In addition, "[A]pparatus claims cover what a device *is*, not what a device *does*." *Hewlett-Packard Co. v. Bausch &Lomb Inc.*, 909 F.2d 1464, 1469, 15 USPQ2d 1525, 1528 (Fed. Cir. 1990) (emphasis in original). Therefore, the various <u>uses</u> recited in the claim (e.g., discharging charges through the conductive layer) fail to define additional structural elements to the device of the instant claim. Because the prior art teaches the <u>structural</u> elements of the claim, the claim is obvious over the prior art. See MPEP § 2114.

It would therefore have been obvious to a person of ordinary skill in the art at the time the claimed invention was made to have modified the sensor comprising the plurality of photosensors as taught by Hollis et al to further comprise the conductive layer of Yasuda et al to arrive at the instantly claimed invention with a reasonable expectation of success. The ordinary artisan would have been motivated to make the modification because said modification would have resulted in a sensor having the added advantage of accelerates the rate of hybridization by bringing the targets to the substrate more quickly as a result of inducing the target polynucleotides to the substrate of the device as explicitly taught by Yasuda et al (column 12, lines 45-60). In addition, it would have been obvious to the ordinary artisan that the known technique of using the conductive layer of Yasuda et al could have been applied to the sensor of Hollis et al with predictable results because the known technique of using the conductive layer of Yasuda et al predictably results in a layer useful in conducting hybridization assays.

It is noted that the specification states on page 48 and in Figures 13A-C that titanium oxide (i.e., titanium dioxide) is an embodiment of the light absorbing layer that selectively absorbs one wavelength of light and transmits another wavelength.

Thus, while Hollis et al teach the substrate is coated with a silicon dioxide layer as an immobilization layer (column 11, lines 40-50) and while Yasuda et al further teach the substrate is coated with an aluminum oxide film immobilization layer 221 (Figure 11 and column 11, lines 1-25), neither Hollis et al nor Yasuda et al teach the oxide comprises titanium dioxide.

However, Yagi teaches an array of photoelectric elements in a solid imaging device in the form of a CCD (Abstract), which is coated with a multilayer optical filter/DNA fixing film (paragraph 0081). The optical filter/fixing film comprises a two layer film having silicon oxide as a top film and a titanium oxide film on the bottom (paragraph 0064). Yagi also teaches the film cuts out excitation light and transmits fluorescent light and has the added advantage of permitting the measurement of the fluorescent light from the DNA probes during irradiation (paragraph 0041). Thus, Yagi teaches the known technique of using a titanium dioxide film to cut out excitation light and transmit fluorescent light.

It would therefore have been obvious to a person of ordinary skill in the art at the time the claimed invention was made to have modified the sensor comprising an oxide as an immobilization layer on top of the conductive layer as taught by Hollis et al in view of Yasuda et al so that the immobilization layer is the titanium dioxide immobilization layer of Yagi to arrive at the instantly claimed invention with a reasonable expectation of

success. The ordinary artisan would have been motivated to make the modification because said modification would have resulted in a sensor having the added advantage of permitting the measurement of the fluorescent light from the DNA probes during irradiation as explicitly taught by Yagi (paragraph 0041). In addition, it would have been obvious to the ordinary artisan that the known technique of using titanium dioxide immobilization layer of Yagi could have been applied to the sensor of Hollis et al in view of Yasuda et al with predictable results because the known technique of using titanium dioxide immobilization layer of Yagi predictably results in a viable layer for immobilizing probes onto an array of photosensors.

Regarding claim 5, Hollis et al teach an optical DNA sensor. In a single exemplary embodiment, Hollis et al teach a device comprising a solid imaging device, in the form of an underlying CCD array having an array test sites formed thereon (Figure 15 and column 3, lines 50-55). Each test site of the array has DNA probes fixed (i.e., attached) thereon (column 4, lines 25-65). The probes at each test site are different (column 3, lines 1-8); thus, the sensor comprises a plurality of types of DNA probes each including a different nucleotide sequence. The CCD array comprises a plurality (i.e., at least 2, Figure 15) of photoelectric elements arranged on a substrate (Figure 15).

As noted above, a reference may be relied upon for all that it would have reasonably suggested to one having ordinary skill the art, including nonpreferred embodiments. Thus, the teaching of Hollis et al that the material to which the DNA probes are fixed **<u>may</u>** be light-transmissive (column 9, lines 15-32) encompasses the

alternate embodiment wherein the material is **not** light-transmissive; i.e., absorbs exciting light.

While Hollis et al teach the photosensor array comprises gate electrodes 220 provided in the solid state imaging device and other layers (Figure 15), Hollis et al do not explicitly teach a conductive layer.

However, Yasuda et al teach an array of electrodes 226 having polynucleotides immobilized thereon and further comprising a conductive coating in the form of electrically conductive film 131 placed on top of electrodes 226, which are embedded in the solid state device (Figure 11 and column 11, lines 40-65). Yasuda et al also teach the conductive film has the added advantage of allowing the inducing of polynucleotides in solution (i.e., target polynucleotides) to the substrate of the device (column 12, lines 45-60), which accelerates the rate of hybridization by bringing the targets to the substrate more quickly.

As noted above, apparatus claims cover what a device *is*, not what a device *does*. Therefore, the various uses recited in the claim (e.g., discharging charges through the conductive layer) fail to define additional structural elements to the device of the instant claim. Because the prior art teaches the structural elements of the claim, the claim is obvious over the prior art.

It would therefore have been obvious to a person of ordinary skill in the art at the time the claimed invention was made to have modified the sensor comprising the plurality of photosensors as taught by Hollis et al to further comprise the conductive layer of Yasuda et al to arrive at the instantly claimed invention with a reasonable

expectation of success. The ordinary artisan would have been motivated to make the modification because said modification would have resulted in a sensor having the added advantage of accelerates the rate of hybridization by bringing the targets to the substrate more quickly as a result of inducing the target polynucleotides to the substrate of the device as explicitly taught by Yasuda et al (column 12, lines 45-60). In addition, it would have been obvious to the ordinary artisan that the known technique of using the conductive layer of Yasuda et al could have been applied to the sensor of Hollis et al with predictable results because the known technique of using the conductive layer of Yasuda et al predictably results in a layer useful in conducting hybridization assays.

It is noted that the specification states on page 48 and in Figures 13A-C that titanium oxide (i.e., titanium dioxide) is an embodiment of the light absorbing layer that selectively absorbs one wavelength of light and transmits another wavelength.

Thus, while Hollis et al teach the substrate is coated with a silicon dioxide layer as an immobilization layer (column 11, lines 40-50) and while Yasuda et al further teach the substrate is coated with an aluminum oxide film immobilization layer 221 (Figure 11 and column 11, lines 1-25), neither Hollis et al nor Yasuda et al teach the oxide comprises titanium dioxide.

However, Yagi teaches an array of photoelectric elements in a solid imaging device in the form of a CCD (Abstract), which is coated (i.e., on the surface) with a multilayer optical filter/DNA fixing film (paragraph 0081). The optical filter/fixing film comprises a two layer film having silicon oxide as a top film and a titanium oxide film on the bottom (paragraph 0064). Yagi also teaches the film cuts out excitation light and

transmits fluorescent light and has the added advantage of permitting the measurement of the fluorescent light from the DNA probes during irradiation (paragraph 0041). Thus, Yagi teaches the known technique of using a titanium dioxide film to cut out excitation light and transmit fluorescent light.

It would therefore have been obvious to a person of ordinary skill in the art at the time the claimed invention was made to have modified the sensor comprising an oxide as an immobilization layer on top of the conductive layer as taught by Hollis et al in view of Yasuda et al so that the immobilization layer is the titanium dioxide immobilization layer of Yagi to arrive at the instantly claimed invention with a reasonable expectation of success. The modification results in the light absorbing layer being coated on the surface of the device, in top of the conductive layer. Thus, because the coatings are on top of the device and cover the photoelectric elements, the photoelectric elements are in the solid imaging device. Because the light reflecting layer of Yagi is a mixed layer for immobilizing polynucleotides, the nucleotide sequences are fixed on the exciting light absorbing layer. The ordinary artisan would have been motivated to make the modification because said modification would have resulted in a sensor having the added advantage of permitting the measurement of the fluorescent light from the DNA probes during irradiation as explicitly taught by Yagi (paragraph 0041). In addition, it would have been obvious to the ordinary artisan that the known technique of using titanium dioxide immobilization layer of Yagi could have been applied to the sensor of Hollis et al in view of Yasuda et al with predictable results because the known technique

of using titanium dioxide immobilization layer of Yagi predictably results in a viable layer for immobilizing probes onto an array of photosensors.

Regarding claim 20, the sensor of claim 1 is discussed above.

Yasuda et al teach the conductive film is used as an anode (column 12, lines 45-60). Manley teaches anodes have positive voltages applied to them (column 3, lines 5-25). Thus, the conductive film has a positive voltage applied, and the modification of the device of Hollis et al with the teachings of Yasuda et al and Yagi results in a device wherein a conductive layer has a positive voltage applied.

In addition, as noted above apparatus claims cover what a device *is*, not what a device *does*. Therefore, the various <u>uses</u> recited in claim 20 (e.g., applying a positive voltage) fail to define additional structural elements to the device of claim 20. Because the prior art teaches the <u>structural</u> elements of claim 20, the claim is obvious over the prior art.

Regarding claim 21, the sensor of claim 1 is discussed above. Yasuda et al further teaches electrically insulating layer 222 between electrodes 226 and conductive layer 131 (Figure 11 and column 11, lines 40-65). Thus, modification of the device of Hollis et al with the teachings of Yasuda et al and Yagi results in a device further comprising an electrically insulating layer between the electrodes and the conductive layer.

Regarding claim 22, the sensor of claim 1 is discussed above. Yagi also teaches the exciting light absorbing layer includes titanium oxide (i.e., titanium dioxide; paragraph 0064). Thus, modification of the sensor of Hollis et al with the teachings of

Yasuda et al and Yagi resulting in an exciting light absorbing layer that includes titanium oxide.

7. Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over Hollis et al (U.S. Patent No. 5,846,708, issued 8 December 1998) in view of Yasuda et al (U.S. Patent No. 6,093,370, issued 25 July 2000) in view of Yagi (U.S. Patent Application Publication No. US 2002/0081716 A1, published 27 June 2002) as applied to claim 1 above, and further in view of Iwasa (U.S. Patent No. 5,381,028, issued 10 January 1995).

Regarding claim 4, the sensor of claim 1 is discussed above in Section 6.

While Hollis et al further teach semiconductor layers (column 14, lines 40-50) and transistors integrated into the substrate (column 20, lines 20-35), neither Hollis et al, Yasuda et al, nor Yagi explicitly teach field effect transistor type photoelectric elements.

However, Iwasa teaches MOS field effect transistors having a semiconductor layer of polysilicon (Abstract), which generated electric charges in response to light in accordance with the example on page 49 of the instant specification. Iwasa also teaches the MOS field effect transistors have the added advantage of fewer defects and utility in the miniaturization of devices (column 1, line 65-column 2, line 3). Thus, Iwasa teaches the known technique of using MOS field effect transistors having a semiconductor layer.

It would therefore have been obvious to a person of ordinary skill in the art at the time the claimed invention was made to have modified the DNA sensor of Hollis et al in

view of Yasuda et al and Yagi so that the photoelectric elements are the field effect transistors of Iwasa to arrive at the instantly claimed invention with a reasonable expectation of success. The ordinary artisan would have been motivated to make such a modification because said modification would have resulted in a DNA sensor having the added advantage of fewer defects in a miniaturized device as explicitly taught by Iwasa (column 1, line 65-column 2, line 3). In addition, it would have been obvious to the ordinary artisan that the known technique of using the MOS field effect transistors having a semiconductor layer of Iwasa could have been applied to the sensor of Hollis et al in view of Yasuda et al and Yagi with predictable results because the MOS field effect transistors having a semiconductor layer of Iwasa predictably result in transistors usable with gate electrodes.

8. Claims 18-19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hollis et al (U.S. Patent No. 5,846,708, issued 8 December 1998) in view of Yasuda et al (U.S. Patent No. 6,093,370, issued 25 July 2000) in view of Yagi (U.S. Patent Application Publication No. US 2002/0081716 A1, published 27 June 2002) in view of Iwasa (U.S. Patent No. 5,381,028, issued 10 January 1995) as applied to claim 4 above, and further in view of Yamada (U.S. Patent No. 5,463,420, issued 31 October 1995).

Regarding claim 18, the sensor of claim 4 is discussed above in Section 7.

While Iwasa teaches a semiconductor layer of polysilicon, which is light sensitive (Abstract) and a bottom gate and top gate electrode (column 2, lines 20-50), neither Hollis et al, Yasuda et al, Yagi, or Iwasa explicitly teach a transparent gate electrode.

However Yamada teaches photoelectric elements comprising a semiconductor layer 5 formed from amorphous silicon, bottom gate electrode 3, and top gate electrode 10, which is transparent (Figure 9 and column 1, lines 35-50). Figure 13A of the instant specification shows that amorphous silicon is photosensitive. Thus, teach the use of a transparent top gate electrode.

It would therefore have been obvious to a person of ordinary skill in the art at the time the claimed invention was made to have modified the device comprising a top gate electrode as taught by Hollis et al in view of Yasuda et al, Yagi, and Iwasa so that the top gate electrode is transparent as taught by Yamada to arrive at the instantly claimed invention with a reasonable expectation of success. It would have been obvious to the ordinary artisan that the known technique of using the transparent top gate electrode of Yamada could have been applied to the sensor of Hollis et al in view of Yasuda et al, Yagi, and Iwasa with predictable results because the known technique of using the transparent top gate electrode of Yamada predictably results in a reliable top gate electrode for a photoelectric device.

Regarding claim 19, the sensor of claim 18 is discussed above. Iwasa teaches the application of negative voltage to the top gate electrode (column 5, lines 35-42). Thus, modification of the sensor of Hollis et al in view of Yasuda et al, Yagi, and

Yamada with the teachings of Iwasa results in a sensor wherein a negative voltage is applied to the top gate electrode

In addition, as noted above apparatus claims cover what a device *is*, not what a device *does*. Therefore, the various uses recited in claim 19 (e.g., applying a negative voltage) fail to define additional structural elements to the device of claim 19. Because the prior art teaches the structural elements of claim 19, the claim is obvious over the prior art.

9. Claims 8, 10-13, and 17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hollis et al (U.S. Patent No. 5,846,708, issued 8 December 1998) in view of Yamada (U.S. Patent No. 5,463,420, issued 31 October 1995).in view of Yasuda et al (U.S. Patent No. 6,093,370, issued 25 July 2000) in view of Yagi (U.S. Patent Application Publication No. US 2002/0081716 A1, published 27 June 2002).

Regarding claim 8, Hollis et al teach an optical DNA sensor. In a single exemplary embodiment, Hollis et al teach a solid imaging device in the form of a CCD array, which comprises a plurality of photoelectric elements arranged apart from each other (i.e., Figure 15). The elements are on substrate that is transparent (column 10, lines 5-6), and has a bottom gate electrode having a shading property; namely, gate electrodes of tungsten (column 9, lines 15-65), which has a shading property because it is not entirely transparent. Each test site of the array has DNA probes fixed (i.e., attached) thereon (column 4, lines 25-65). The probes at each test site are different (column 3, lines 1-8); thus, the sensor comprises a plurality of types of DNA probes

each including a different nucleotide sequence. The DNA probes are fixed on a dielectric multilayered film; namely, a first layer of material and an upper protective layer of silicon nitride are on the substrate, wherein the silicon nitride is transparent and has the probes thereon (column 9, lines 15-32).

While Hollis et al teach the photosensor array comprises gate electrodes 220 provided in the solid state imaging device and other layers (Figure 15), Hollis et al do not explicitly teach the layered gate electrode structure of the claim or a means for applying a voltage to each of the top gate electrodes.

However, Yamada teaches photoelectric sensors comprising, in order, a bottom gate electrode 3, a semiconductor layer 5 formed from amorphous silicon and top gate electrode 10, which is transparent (Figure 9 and column 1, lines 35-50). Figure 13A of the instant specification shows that amorphous silicon is photosensitive. Yamada also teaches means for the application of voltages to teach of the gate electrodes in the form of a supply circuit that applies voltages to the top gate electrodes (Figure 5 and column 6, line 35-column 7, line 5). Thus, Yamada teaches the known technique of having the layered gate electrode structure of the claim, a means for applying a voltage to each of the top gate electrodes.

As noted above apparatus claims cover what a device *is*, not what a device *does*. Therefore, the various <u>uses</u> recited in the claim (e.g., applying a negative voltage) fail to define additional structural elements to the device of the claim. Because the prior art teaches the <u>structural</u> elements of the claim, the claim is obvious over the prior art.

It would therefore have been obvious to a person of ordinary skill in the art at the time the claimed invention was made to have modified the device comprising a gate electrode as taught by Hollis et al so that the device comprises the layered gate electrode structure of the claim, a means for applying a voltage to each of the top gate electrodes as taught by Yamada to arrive at the instantly claimed invention with a reasonable expectation of success. It would have been obvious to the ordinary artisan that the known technique of using the layered gate electrode structure of the claim, a means for applying a voltage to each of the top gate electrodes as taught by Yamada could have been applied to the sensor of Hollis et al with predictable results because the known technique of using the layered gate electrode structure of the claim, a means for applying a voltage to each of the top gate electrodes as taught by Yamada predictably results in a reliable photoelectric element.

While Hollis et al teach the photosensor array comprises other layers (Figure 15), neither Hollis et al nor Yamada explicitly teach a conductive layer.

However, Yasuda et al teach an array of electrodes 226 having polynucleotides immobilized thereon and further comprising a conductive coating in the form of electrically conductive film 131 placed on top of electrodes 226, which are embedded in the solid state device (Figure 11 and column 11, lines 40-65). Yasuda et al further teaches electrically insulating layer 222 between electrodes 226 and conductive layer 131 (Figure 11 and column 11, lines 40-65). Yasuda et al also teach the conductive film has the added advantage of allowing the inducing of polynucleotides in solution (i.e., target polynucleotides) to the substrate of the device (column 12, lines 45-60), which

accelerates the rate of hybridization by bringing the targets to the substrate more quickly.

As noted above, apparatus claims cover what a device *is*, not what a device *does*. Therefore, the various uses recited in the claim (e.g., discharging charges through the conductive layer) fail to define additional structural elements to the device of the instant claim. Because the prior art teaches the structural elements of the claim, the claim is obvious over the prior art.

It would therefore have been obvious to a person of ordinary skill in the art at the time the claimed invention was made to have modified the sensor comprising the plurality of photosensors as taught by Hollis et al in view of Yamada to further comprise the insulative layer on top of the photoelectric elements (i.e. electrodes) and the additional conductive layer of Yasuda et al to arrive at the instantly claimed invention with a reasonable expectation of success. The ordinary artisan would have been motivated to make the modification because said modification would have resulted in a sensor having the added advantage of accelerates the rate of hybridization by bringing the targets to the substrate more quickly as a result of inducing the target polynucleotides to the substrate of the device as explicitly taught by Yasuda et al (column 12, lines 45-60). In addition, it would have been obvious to the ordinary artisan that the known technique of using the conductive layer of Yasuda et al could have been applied to the sensor of Hollis et al in view of Yamada with predictable results because the known technique of using the conductive layer of Yasuda et al predictably results in a layer useful in conducting hybridization assays.

It is noted that the specification states on page 48 and in Figures 13A-C that titanium oxide (i.e., titanium dioxide) is an embodiment of the light absorbing layer that selectively absorbs one wavelength of light and transmits another wavelength.

Thus, while Hollis et al teach the substrate is coated with a silicon dioxide layer as an immobilization layer (column 11, lines 40-50) and while Yasuda et al further teach the substrate is coated with an aluminum oxide film immobilization layer 221 (Figure 11 and column 11, lines 1-25), neither Hollis et al, Yamada, nor Yasuda et al teach the oxide comprises titanium dioxide.

However, Yagi teaches an array of photoelectric elements in a solid imaging device in the form of a CCD (Abstract), which is coated with a multilayer optical filter/DNA fixing film (paragraph 0081). The optical filter/fixing film comprises a two layer film having silicon oxide as a top film and a titanium oxide film on the bottom (paragraph 0064). Yagi also teaches the film cuts out excitation light and transmits fluorescent light and has the added advantage of permitting the measurement of the fluorescent light from the DNA probes during irradiation (paragraph 0041). Thus, Yagi teaches the known technique of using a titanium dioxide film to cut out excitation light and transmit fluorescent light.

It would therefore have been obvious to a person of ordinary skill in the art at the time the claimed invention was made to have modified the sensor comprising an oxide as an immobilization layer on top of the conductive layer as taught by Hollis et al in view of Yamada and Yasuda et al so that the immobilization layer is the titanium dioxide immobilization layer of Yagi to arrive at the instantly claimed invention with a reasonable

expectation of success. The ordinary artisan would have been motivated to make the modification because said modification would have resulted in a sensor having the added advantage of permitting the measurement of the fluorescent light from the DNA probes during irradiation as explicitly taught by Yagi (paragraph 0041). In addition, it would have been obvious to the ordinary artisan that the known technique of using titanium dioxide immobilization layer of Yagi could have been applied to the sensor of Hollis et al in view of Yamada and Yasuda et al with predictable results because the known technique of using titanium dioxide immobilization layer of Yagi predictably results in a viable layer for immobilizing probes onto an array of photosensors.

Regarding claim 10, Hollis et al teach a DNA reading apparatus. In a single exemplary embodiment, Hollis et al teach a solid imaging device in the form of a CCD array, which comprises a plurality of photoelectric elements arranged apart from each other (i.e., Figure 15). The elements are on substrate that is transparent (column 10, lines 5-6), and has a bottom gate electrode having a shading property; namely, gate electrodes of tungsten (column 9, lines 15-65), which has a shading property because it is not entirely transparent. Each test site of the array has DNA probes fixed (i.e., attached) thereon (column 4, lines 25-65). The probes at each test site are different (column 3, lines 1-8); thus, the sensor comprises a plurality of types of DNA probes each including a different nucleotide sequence. The DNA probes are fixed on a dielectric multilayered film; namely, a first layer of material and an upper protective layer of silicon nitride are on the substrate, wherein the silicon nitride is transparent and has the probes thereon (column 9, lines 15-32).

While Hollis et al teach the photosensor array comprises gate electrodes 220 provided in the solid state imaging device and other layers (Figure 15), Hollis et al do not explicitly teach the layered gate electrode structure of the claim, a means for applying a voltage to each of the top gate electrodes, or a light irradiation member.

However, Yamada teaches photoelectric sensors comprising, in order, a bottom gate electrode 3, a semiconductor layer 5 formed from amorphous silicon and top gate electrode 10, which is transparent (Figure 9 and column 1, lines 35-50). Figure 13A of the instant specification shows that amorphous silicon is photosensitive. Yamada also teaches means for the application of voltages to teach of the gate electrodes in the form of a supply circuit that applies voltages to the top gate electrodes (Figure 5 and column 6, line 35-column 7, line 5). Thus, Yamada teaches the known technique of having the layered gate electrode structure of the claim, a means for applying a voltage to each of the top gate electrodes.

As noted above apparatus claims cover what a device *is*, not what a device *does*. Therefore, the various <u>uses</u> recited in the claim (e.g., applying a negative voltage) fail to define additional structural elements to the device of the claim. Because the prior art teaches the <u>structural</u> elements of the claim, the claim is obvious over the prior art.

It would therefore have been obvious to a person of ordinary skill in the art at the time the claimed invention was made to have modified the device comprising a gate electrode as taught by Hollis et al so that the device comprises the layered gate electrode structure of the claim, a means for applying a voltage to each of the top gate electrodes as taught by Yamada to arrive at the instantly claimed invention with a

reasonable expectation of success. It would have been obvious to the ordinary artisan that the known technique of using the layered gate electrode structure of the claim, a means for applying a voltage to each of the top gate electrodes as taught by Yamada could have been applied to the sensor of Hollis et al with predictable results because the known technique of using the layered gate electrode structure of the claim, a means for applying a voltage to each of the top gate electrodes as taught by Yamada predictably results in a reliable photoelectric element.

While Hollis et al teach the photosensor array comprises other layers (Figure 15), neither Hollis et al nor Yamada explicitly teach a conductive layer or a light source.

However, Yasuda et al teach an array of electrodes 226 having polynucleotides immobilized thereon and further comprising a conductive coating in the form of electrically conductive film 131 placed on top of electrodes 226, which are embedded in the solid state device (Figure 11 and column 11, lines 40-65). Yasuda et al further teaches electrically insulating layer 222 between electrodes 226 and conductive layer 131 (Figure 11 and column 11, lines 40-65), as well as a light irradiation member in the form of light source 16 (figure2 and Embodiment 1). Yasuda et al also teach the conductive film has the added advantage of allowing the inducing of polynucleotides in solution (i.e., target polynucleotides) to the substrate of the device (column 12, lines 45-60), which accelerates the rate of hybridization by bringing the targets to the substrate more quickly.

As noted above, apparatus claims cover what a device *is*, not what a device *does*. Therefore, the various <u>uses</u> recited in the claim (e.g., discharging charges through

the conductive layer and irradiating toward a rear surface) fail to define additional structural elements to the device of the instant claim. Because the prior art teaches the structural elements of the claim, the claim is obvious over the prior art.

It would therefore have been obvious to a person of ordinary skill in the art at the time the claimed invention was made to have modified the sensor comprising the plurality of photosensors as taught by Hollis et al in view of Yamada to further comprise the insulative layer on top of the photoelectric elements (i.e. electrodes), the additional conductive layer, and the light irradiation member of Yasuda et al to arrive at the instantly claimed invention with a reasonable expectation of success. The ordinary artisan would have been motivated to make the modification because said modification would have resulted in a sensor having the added advantage of accelerates the rate of hybridization by bringing the targets to the substrate more quickly as a result of inducing the target polynucleotides to the substrate of the device as explicitly taught by Yasuda et al (column 12, lines 45-60). In addition, it would have been obvious to the ordinary artisan that the known technique of using the layers and light irradiation member of Yasuda et al could have been applied to the sensor of Hollis et al in view of Yamada with predictable results because the known technique of using the conductive layer of Yasuda et al predictably results in a layer useful in conducting optical excitation based hybridization assays.

It is noted that the specification states on page 48 and in Figures 13A-C that titanium oxide (i.e., titanium dioxide) is an embodiment of the light absorbing layer that selectively absorbs one wavelength of light and transmits another wavelength.

Thus, while Hollis et al teach the substrate is coated with a silicon dioxide layer as an immobilization layer (column 11, lines 40-50) and while Yasuda et al further teach the substrate is coated with an aluminum oxide film immobilization layer 221 (Figure 11 and column 11, lines 1-25), neither Hollis et al, Yamada, nor Yasuda et al teach the oxide comprises titanium dioxide.

However, Yagi teaches an array of photoelectric elements in a solid imaging device in the form of a CCD (Abstract), which is coated with a multilayer optical filter/DNA fixing film (paragraph 0081). The optical filter/fixing film comprises a two layer film having silicon oxide as a top film and a titanium oxide film on the bottom (paragraph 0064). Yagi also teaches the film cuts out excitation light and transmits fluorescent light and has the added advantage of permitting the measurement of the fluorescent light from the DNA probes during irradiation (paragraph 0041). Thus, Yagi teaches the known technique of using a titanium dioxide film to cut out excitation light and transmit fluorescent light.

It would therefore have been obvious to a person of ordinary skill in the art at the time the claimed invention was made to have modified the sensor comprising an oxide as an immobilization layer on top of the conductive layer as taught by Hollis et al in view of Yamada and Yasuda et al so that the immobilization layer is the titanium dioxide immobilization layer of Yagi to arrive at the instantly claimed invention with a reasonable expectation of success. The ordinary artisan would have been motivated to make the modification because said modification would have resulted in a sensor having the added advantage of permitting the measurement of the fluorescent light from the DNA

probes during irradiation as explicitly taught by Yagi (paragraph 0041). In addition, it would have been obvious to the ordinary artisan that the known technique of using titanium dioxide immobilization layer of Yagi could have been applied to the sensor of Hollis et al in view of Yamada and Yasuda et al with predictable results because the known technique of using titanium dioxide immobilization layer of Yagi predictably results in a viable layer for immobilizing probes onto an array of photosensors

Regarding claim 11, the apparatus of claim 10 is discussed above.

While Figure 2 of Yasuda et al shows the light irradiation member 16 above, the DNA sensor, the courts have held that the rearrangement of parts within a device is obvious when the arrangement does not specifically modify the operation of the device (*In re Japikse*, 181 F.2d 1019, 86 USPQ 70 (CCPA 1950)). See MPEP §2144.04.

Regarding claims 12-13 and 17, the sensor of claim 11 is discussed above.

As noted above apparatus claims cover what a device *is*, not what a device *does*. Therefore, the various <u>uses</u> recited in claims 12-13 and 17 (e.g., irradiating a phosphor [i.e., claim 12], or exciting a fluorescent substance [i.e., claims 13 and 17]) fail to define additional structural elements to the device of claim 11. Because the prior art teaches the <u>structural</u> elements of the instant claims, the claims are obvious over the prior art.

10. Claim 23 is rejected under 35 U.S.C. 103(a) as being unpatentable over Hollis et al (U.S. Patent No. 5,846,708, issued 8 December 1998) in view of Yasuda et al (U.S. Patent No. 6,093,370, issued 25 July 2000) in view of Yagi (U.S. Patent Application Publication No. US 2002/0081716 A1, published 27 June 2002) as applied to claims 1 and 22 above, and further in view of Freeman et al (U.S. Patent No. 5,551,975, issued 3 September 1996).

Regarding claim 23, the method of claims 1 and 22 is discussed above in Section 6.

Neither Hollis et al, Yasuda et al, nor Yagi explicitly teach the titanium dioxide is rutile-type.

However, Freeman et al teach rutile titanium oxide (i.e., TiO2) has the added advantage of being readily available in slurry form (Example 8). Thus, Freeman et al teach the known technique of using rutile titanium oxide.

It would therefore have been obvious to a person of ordinary skill in the art at the time the claimed invention was made to have modified the sensor comprising a titanium oxide immobilization layer on top of the conductive layer as taught by Hollis et al in view of Yasuda et al and Yagi so that the titanium dioxide immobilization layer comprises rutile-type titanium oxide as taught by Freeman et al to arrive at the instantly claimed invention with a reasonable expectation of success. The ordinary artisan would have been motivated to make the modification because said modification would have resulted in a sensor having the added advantage of using a form of titanium oxide that is readily available in slurry form as explicitly taught by Freeman et al (Example 8). In addition, it

would have been obvious to the ordinary artisan that the known technique of using rutile-type titanium dioxide as taught by Freeman et al could have been applied to the sensor of Hollis et al in view of Yasuda et al and Yagi with predictable results because the known technique of using rutile-type titanium dioxide as taught by Freeman et al predictably results in a form of titanium oxide readily usable in optical applications.

11. Claims 24-25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hollis et al (U.S. Patent No. 5,846,708, issued 8 December 1998) in view of Yasuda et al (U.S. Patent No. 6,093,370, issued 25 July 2000) in view of Yagi (U.S. Patent Application Publication No. US 2002/0081716 A1, published 27 June 2002) as applied to claim 1 above, and further in view of Duveneck et al (U.S. Patent No. 6,395,558 B1, issued 28 May 2002).

Regarding claims 24-25, the sensor of claim 1 is discussed above in Section 6.

It is noted that page and figures 13A-C state that a titanium dioxide (i.e., titanium oxide or TiO2) layer of at least 100 nm (i.e., claim 25) transmits 308 nm light 1000 times less than 520 nm light (i.e., claim 24).

While Hollis et al teach layers of 200 Angstroms (i.e., 200 nm; column 6, lines 5-25), and while Yagi teaches films having 10-20 micron thicknesses (i.e., 10000-20000 nm; paragraph 0047) and that the thickness of the light absorbing layer is tailored based on the wavelength of light being filtered (paragraph 0064), neither Hollis et al, Yasuda et al, nor Yagi teach the TiO2 layer is at least 100 nm thick (i.e., claims 24-25).

However, Duveneck et al teach an optical biosensor having a TiO2 film that is 154.5nm thick (column 15, lines 1-12), which has the added advantage of allowing changes in the effective refractive index of the recognition (i.e., probe) layer to be converted into a measurable variable (Abstract). Thus, Duveneck et al teach the known technique of using a TiO2 layer having a thickness of greater than 100 nm (i.e., claim 25), which transmits 308 nm light 1000 times less than 520 nm light (i.e., claim 24).

It would therefore have been obvious to a person of ordinary skill in the art at the time the claimed invention was made to have modified the sensor comprising a titanium oxide immobilization layer on top of the conductive layer as taught by Hollis et al in view of Yasuda et al and Yagi so that the titanium dioxide immobilization layer is more than 100 nm thick (i.e., claim 2h), which transmits 308 nm light 1000 times less than 520 nm light (i.e., claim 24) as taught by Duveneck et al to arrive at the instantly claimed invention with a reasonable expectation of success. The ordinary artisan would have been motivated to make the modification because said modification would have resulted in a sensor having the added advantage of allowing changes in the effective refractive index of the probe layer to be converted into a measurable variable as explicitly taught by Duveneck et al (Abstract). In addition, it would have been obvious to the ordinary artisan that the known technique of using titanium dioxide immobilization layer having the thickness of Duveneck et al could have been applied to the sensor of Hollis et al in view of Yasuda et al and Yagi with predictable results because the known technique of using titanium dioxide immobilization layer having the thickness of Duveneck et al

predictably results in a viable layer for immobilizing probes onto an array of photosensors.

Response to Arguments

12. Applicant's arguments with respect to the previous rejections of the claims have been considered but are moot in view of the new ground(s) of rejection necessitated by the amendments.

Conclusion

13. No claim is allowed.

14. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

15. A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

16. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Robert T. Crow whose telephone number is (571)272-1113. The examiner can normally be reached on Monday through Friday from 8:00 am to 4:30 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Ram Shukla can be reached on (571) 272-0735. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Robert T. Crow/
Examiner, Art Unit 1634

Robert T. Crow
Examiner
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/Diana B. Johannsen/
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